

MISCELLANEOUS.

On the Flowering and Fructification of the Vine.

By H. MARÈS and J. PLANCHON.

IN this succinct summary of our researches upon a subject apparently exhausted we shall confine ourselves to the exposition of some prominent facts, passing designedly over points of secondary importance.

The general structure of the flowers of the cultivated vine is well known:—a calyx with five denticles, a corolla with five petals, the edges of which touch and remain adherent at the apex, so as to form a hood, which is most frequently raised by the stamina; five stamina opposite to the petals, with subulate filaments longer than the corolla; five hypogynous nectariferous glands; an ovary with two or three cells, produced into a short style, which is terminated by two or three imperfectly marked stigmatic lobules.

A singular deviation from this normal structure has been indicated by one of us in certain varieties of vines grown in the south, especially in the "Terrets." These are the stocks or the bunches of flowers called in the idiom of Languedoc *avalidouïres*, from an old word *avali*, which implies the idea of disappearing, or becoming effaced, without leaving any traces. The entire stocks affected by this degeneration remain, in fact, absolutely sterile, except by the intervention, whether accidental or artificial, of pollen derived from other bunches, and capable of fecundating the ovaries of their flowers. These flowers may be recognized at first sight by the following characters:—their corolla, which persists for a long time, opens and spreads into a five-rayed wheel, instead of forming a hood and falling in a single piece; their petals are greener and thicker than in the normal state. The stamina, with comparatively short filaments, present large anthers, of which the two thick turgid cells, with well-marked fissures of dehiscence, either do not open at all or only imperfectly, and contain only a pollen with lax and wrinkled grains; that is to say, these stamina are barren. The ovary and stigma, on the contrary, are well formed and susceptible of impregnation.

Another type of abnormal flowers is that of the stocks called *coulards*, a word which sufficiently expresses that we have to do with bunches subject to drop and only forming scattered grapes. This relative sterility, however, does not depend upon external causes, such as unfavourable climatic conditions, although these may aggravate it. It is due to the structure of the dropping flowers. These, in some respects, occupy a middle place between the *avalidouïres* and the normal flowers. They often present one, two, or three free petals side by side, with four, three, or two others which adhere by their apices to form an incomplete hood. The æstivation of these petals is slightly imbricated. Very often the five petals remain more or less united; but their widened apices, which are slightly undulated and bordered with a little red edge, have an open-

ing between them enabling the stigma to be seen. Of the stamina of a single flower, some have the filaments slender and the anthers dehiscent; these are more or less fertile; the others with shorter filaments, and with the anthers imperfectly dehiscent, are, of course, sterile. The pistil is constructed as usual. Consequently the pollen of the few fertile anthers, or that of neighbouring flowers, causes a few of the ovaries to develop into fruits. Artificial fecundation by means of the pollen of other flowers of the vine greatly increases the proportion of these fertile fruits in the *coulards*.

A third deviation from the normal type is met with in the flowers. This is the case of double flowers, by the transformation of the ordinary into more or less petaloid stamina, of the five nectariferous glands into five staminodes either free, or united into a tube, and, lastly, of the ovary into a bundle of little, imperfect leaves, forming a sort of bud in the centre of the flower, and each of which, representing a carpellary leaf with or without rudiments of ovules, may be ovuliferous upon its margins, or at once upon its inner, stigmatic and polliniferous surfaces, for a variable portion of its apex. This curious monstrosity, of which one of us intends publishing the details in the 'Annales des Sciences Naturelles,' possesses peculiar interest in a botanical point of view; in fact it recalls the normal state of the genus *Leea*, just as the *avalidouïre* abnormal type does the normal flowers of *Cissus*.

After the above statements as to the regular or monstrous organization of the flowers of the vine, it will be easy to explain the principal physiological facts of our subject.

The flowers of the cultivated vine seem to be all hermaphrodite. Perhaps, indeed, nearly the whole of them are so, although a very great number of the flowers of a bunch regularly fall without setting and, especially, without ripening fruits. The habitual abortion of a large proportion of the fruits, and the incomplete development of many others, depend less, no doubt, upon the state of the organs of fecundation than upon the preponderance early acquired by the young fruit situated at the extremity of each branch of the thyrsus. These young fruits serve to starve their neighbours, and sooner or later bring on their atrophy.

There are, nevertheless, cases in which, in flowers apparently well formed, the anthers, whiter than usual, prove to be empty of pollen. These flowers, which have become female by the imperfection of their stamina, sometimes accompany the ordinary or hermaphrodite flowers. Here, therefore, we have polygamy with excess of pistils (or, if it be preferred, imperfection of stamina) in some flowers.

In other cases a very great number of ovaries set and pass into the state of fruit, but furnish grapes of very small size and destitute of seeds. These grapes are called *millerands* (probably from *mille grana*). An imperfect fecundation has developed only the pericarp, leaving the ovules in a rudimentary state. We shall recur hereafter to the characters of this imperfect development of the fruit.

This is the place to indicate some remarkable peculiarities of the flowering of the *Lambrusques*, or wild vines, which occur in such

great abundance in the woods and copses of our southern Departments. At the first glance it is easy to see that the flowers of these wild vines differ considerably from those of the cultivated vines. Their stamina have the filaments longer and more slender; their style, on the contrary, is much shorter, or might almost be said to be wanting. They are, moreover, more odorous, the nectariferous glands being proportionally more developed. The fruits are much smaller, with the stones less numerous and larger in proportion than in the ordinary cultivated varieties.

Notwithstanding the hundreds of flowering bunches with which the climbing stems of the "Lambrusques" are covered, entire stocks remain absolutely infertile—that is to say, without fruit. Nevertheless their flowers seem to be regularly constructed. The old individuals are the only ones which bear fruit. Does the barrenness of the young stocks arise from the too great luxuriance of the vegetative organs in the period of their first vigour? This would appear to be proved by the fact that cultivated "Lambrusques" habitually become infertile, and that pruning, which gives vigour to their shoots, prevents their setting fruit.

We postpone the closer examination of this question of the "Lambrusques," both from a physiological point of view and as regards the relations of this supposed wild type to the cultivated varieties of the vine.

Let us now study the mode of fecundation of the vine. It has long been suspected that impregnation takes place beneath the hood itself of the calyptriform corolla. Appearances indicated this, and our observations have placed it beyond a doubt; at least this is the mode in which the phenomenon usually occurs. In the morning especially, at the moment when the first rays of the sun of May or June strike the buds which are ready to open, we see, in a few seconds, the corollas, splitting in five lines from the bottom, detach themselves from the calyx, rise under the pressure of the stamina (the inflected filaments of which erect themselves rapidly), and lastly fall in a single piece, exposing the stamina, which separate by diverging and curving backwards, whilst the pistil makes its appearance with its stigma already powdered with pollen. Microscopical examination shows that this pollen acts very quickly upon the stigma of its own flower, producing fecundating tubes in a few hours. Another proof that fecundation takes place beneath the hood of the corolla is, that, in certain stocks, on particular bunches the hood of the corolla, instead of falling, remains hermetically applied to the summit of the ovary, and even dries there, serving as a permanent cap to the young grape when it is already set and growing.

This direct fecundation of a pistil by the pollen of its own flower is therefore habitual in the vine. It is not, however, the only possible mode; and the proof that there are others consists in the evident existence of intercrossings between varieties of vines, and the results which have been for a long time obtained from them.

One of the most remarkable of these crossings, especially as regards the effect produced, is certainly to be found in the hybrids

obtained by M. Bouschet-Bernard père and M. Henri Bouschet between various southern stocks (*aramon, grenache, &c.*) with colourless juice and the grape called the *Teinturier*, of which the juice is coloured. Leaving out of consideration M. H. Bouschet's notions, in our opinion incorrect, of the influence of the pollen of the "Teinturier" as a direct modifier of the ovary of the varieties which it fecundates, we admit as indubitable the mixed, hybrid nature of the *Petit Bouschet* or *Aramon-teinturier*, and of the *Alicant-Bouschet*, and even of quadron hybrids, all with coloured juice, between the *Petit Bouschet* and other stocks with colourless juice. Now in these cases the impregnation was effected by a very simple process, namely the approximation of the flowering bunches of the two types by interlacing and contact. This last condition, however, is not indispensable. It is sufficient that the distance of the bunches to be mutually fecundated be but small; the seeds of the approximated grapes furnished mixed products having evident traces of the characters of their parents.

What, in this process and generally in nature, is the agent of transport of the pollen from one flower to another? Is it the wind? Is it the mutual friction of the flowers in contact? Is it the intervention of insects? Perhaps one or all of these, according to circumstances. That the wind transports mixed pollinic dust will not be disputed by any one who has seen the flowering bunches of the vine, their abundance and their pulverulent and light pollen. That friction may act is probable in the case of stocks which, like those of the southern vines, so slightly interlace their branches and floriferous thyrsi. Lastly, we may suppose that insects assist, at least as regards the nocturnal Lepidoptera (*Noctuidæ, Pyralidæ, &c.*); in the daytime, on the contrary, we have only seen upon the flowers of the vine, at least habitually, a species of *Dasytes*, and a larva or nymph of a *Locusta*, leaving out of the account the caterpillars of *Pyralis*, and especially of *Cochylis*, which haunt the bunches rather as enemies than as auxiliaries, and destroy much more than they fecundate.

To sum up. The impregnation of the flowers of the vine is effected habitually beneath the hood of the corolla; each flower then fecundates itself. Foreign pollen may nevertheless, in various ways, attain the stigma of flowers, either unimpregnated (*avali-douïres, coulards*) or already covered with pollen. The sterility of certain flowers is explained by the imperfection of the stamina (*avali-douïres, coulards*); that of the young or pruned "Lambrusque" is probably caused by the too great vigour of the vegetation, a derivation of the sap from the flowers towards the leaves; that of the double flowers is due to the transformation of the stamina and pistils into petaloid or foliaceous organs.

It may be added that the floral degenerations known as *avali-douïres, coulards*, and double flowers appear sometimes suddenly in vines which presented no traces of them, that they occur especially in wet soils in which the rains of winter and spring remain, that they affect entire stocks, that they persist habitually in the stock

when once they have attacked it, and are even propagated by layers and cuttings, that grafting alone can cure the evil, when it is desired to avoid the radical remedy of pulling up, and, lastly, that certain varieties are more subject than others to this organic change—the “Terret noir,” for example, being most inclined to become *avalidouïre* or *coulard*, and the “*Clairette blanche*” being hitherto the only one which has furnished us with double flowers.—*Comptes Rendus*, February 11, 1867, pp. 254–259.

Note on the Law of Sexual Development in Insects.

By H. LANDOIS.

It is generally supposed, from the observations of Dzierzon and Von Siebold, that the working bees originate from ova fecundated by the queen which deposits them, by means of the semen of her *receptaculum seminis*, whilst the male bees issue from non-fecundated ova. Von Siebold especially averred that the demonstrated existence of spermatozoids in the eggs of worker-cells, and their non-existence in those of drone-cells, sufficiently prove that in bees the formation of the sexes depends upon fecundation. But the eggs from which worker bees originate are deposited, as is well known, in different cells from those of the males; and, moreover, the paste which serves for the nourishment of the young bees is not the same in the two cases. Hence naturally arose the question whether it would not be possible to produce male bees from eggs laid by the queen in cells intended for workers, by transferring these eggs into cells made for drones, and taking care that the adult workers should not give the larvæ any nourishment but that on which the drones are fed. On the other hand, by a similar transfer, might not workers be produced from drone-eggs?

I have made this experiment several times,—at first, indeed, without success, because the bees quickly destroyed my work of transfer; but finally I succeeded in deceiving them, not only once, but repeatedly. I may remark that we cannot succeed in the transfer of the eggs if they are removed from an oviferous comb into another containing no eggs. The eggs being extremely delicate, care must be taken not to touch them in transferring them. To manage this, by means of a small pointed knife I cut the bottom of the cell a little round each egg, and then, removing the little fragment of wax with the egg which it bore, I transported it into another cell.

I was surprised to see worker bees originate from male eggs, and *vice versd*. There could not be any error in the experiment, for I made my observations several times every day; besides, when the bees had emerged, the shell of the egg was still to be seen placed upon the little morsel of wax which had served to transport it. According to these experiments, therefore, it is not to the fecundation of the eggs, or to the want of this fecundation, that we can ascribe the production of workers or drones; but it is upon the food that the sexual characters of the bees depend.—*Comptes Rendus*, February 4, 1867, pp. 222–224.